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(54) **SAFETY INTRAVENOUS CANNULA**

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(57) **ABSTRACT**

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A61M 25/00 (2006.01)

A61M 25/06 (2006.01)

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CPC *A61M 25/0097* (2013.01); *A61M 25/0043* (2013.01); *A61M 25/0625* (2013.01); *A61M 25/0662* (2013.01); *A61M 2205/02* (2013.01)

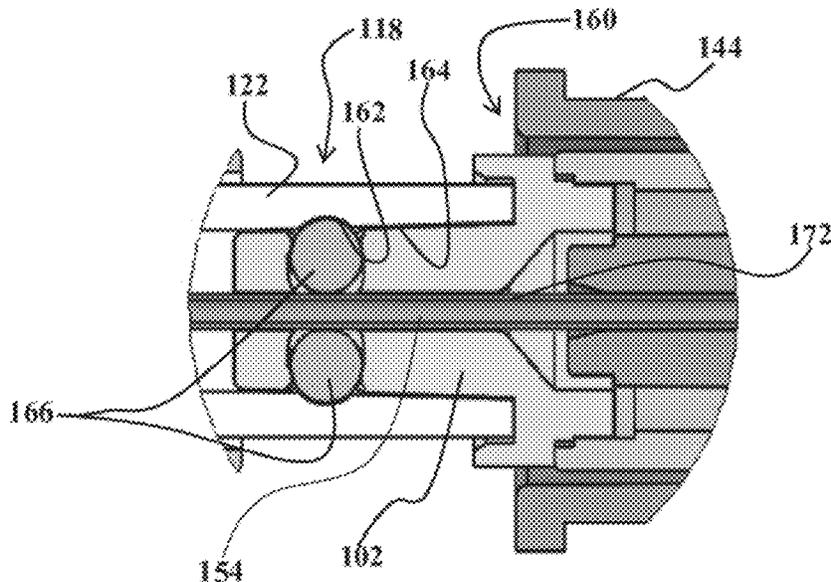
(58) **Field of Classification Search**

CPC A61M 25/0097; A61M 25/0625; A61M 25/0662; A61M 2205/02; A61M 25/0043; A61M 25/0606; A61M 25/0631

See application file for complete search history.

The present invention relates to a cannula comprising a catheter assembly, a body member, an elongated tubular member, a needle hub, and a safety device fixedly connected to a distal end of the elongated tubular member and releasably connected to the body member. The body member includes an annular groove, and the safety device comprises locking elements. When the needle is retracted from the catheter assembly after puncturing the vein of a patient, the body member is disengaged by disengaging the locking elements from the annular groove, thereby separating the safety device from the body member after the needle has been arrested within safety device. The locking elements are solid spherical elements of stainless steel material.

9 Claims, 10 Drawing Sheets



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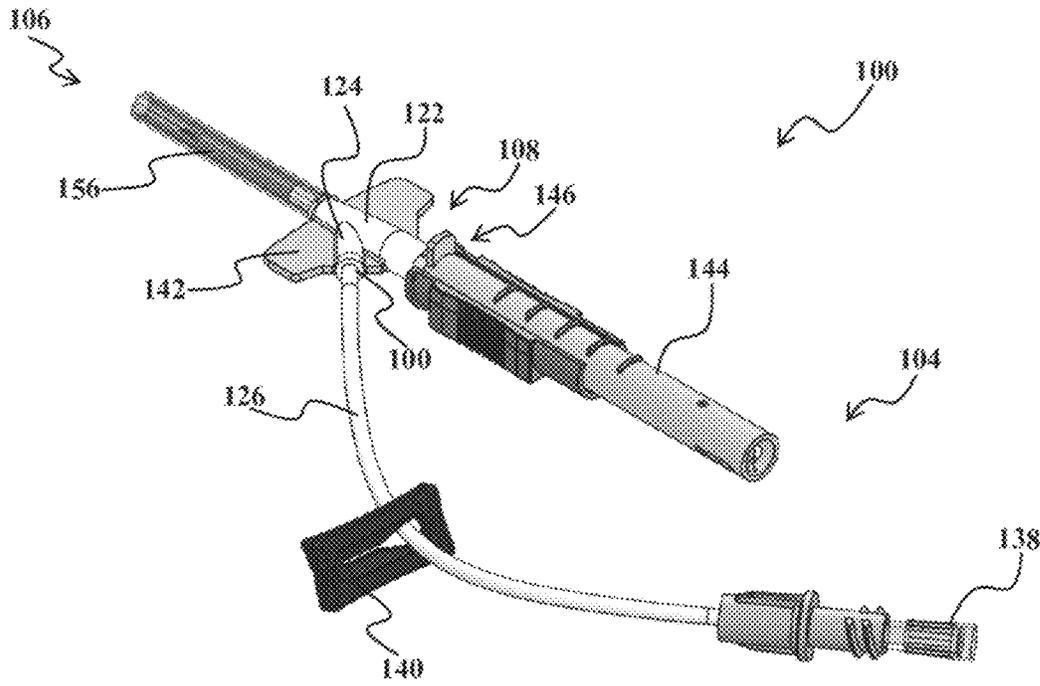


FIG. 1

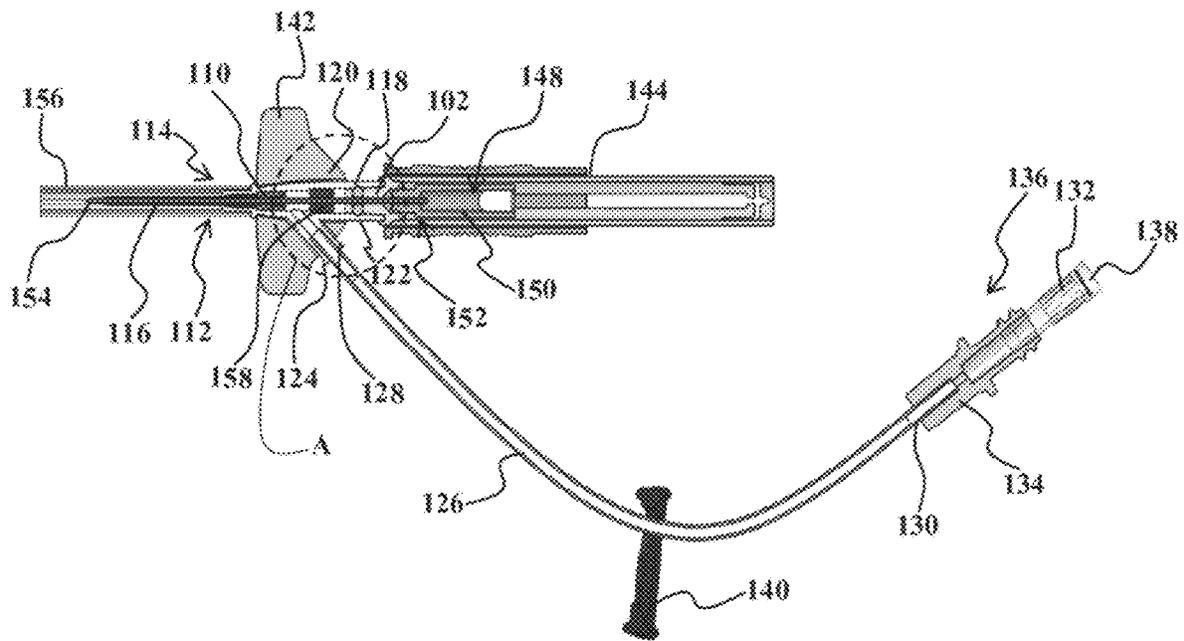


FIG. 2

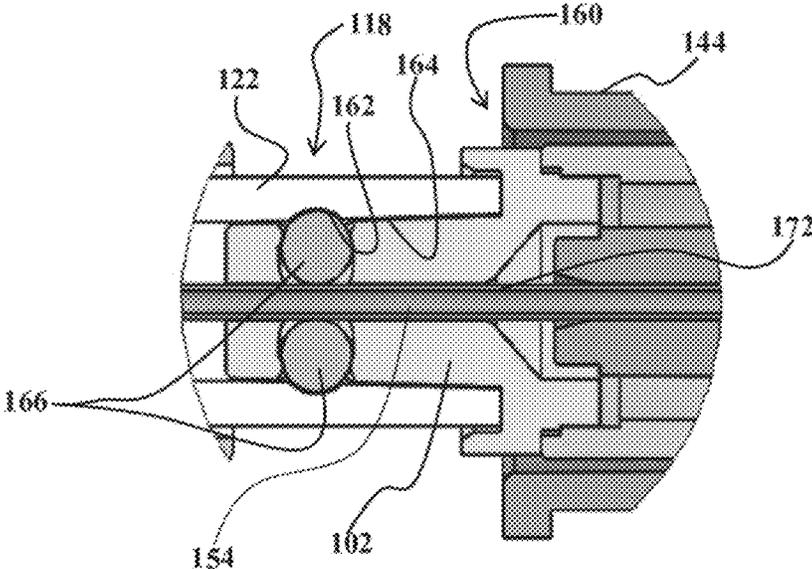


FIG. 3

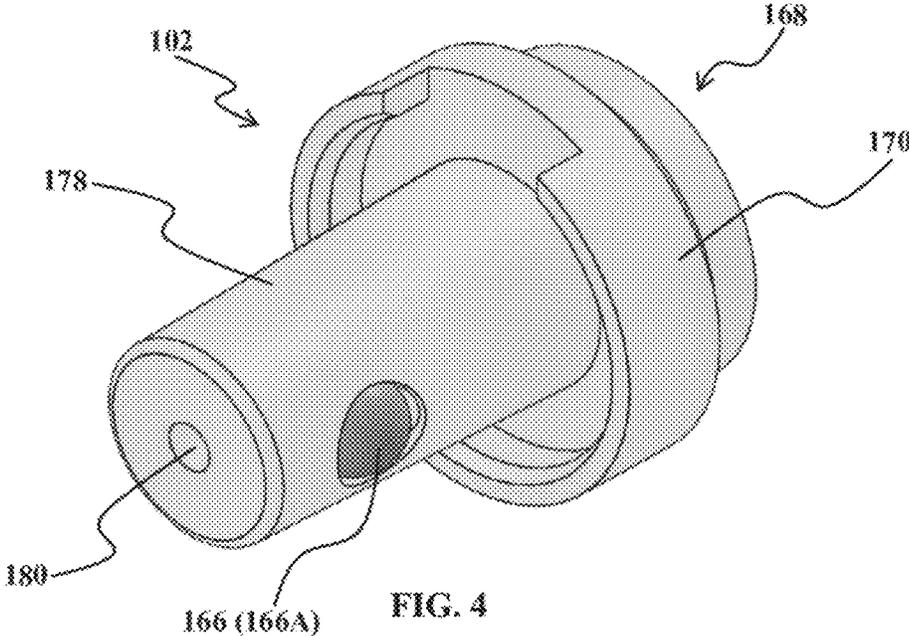
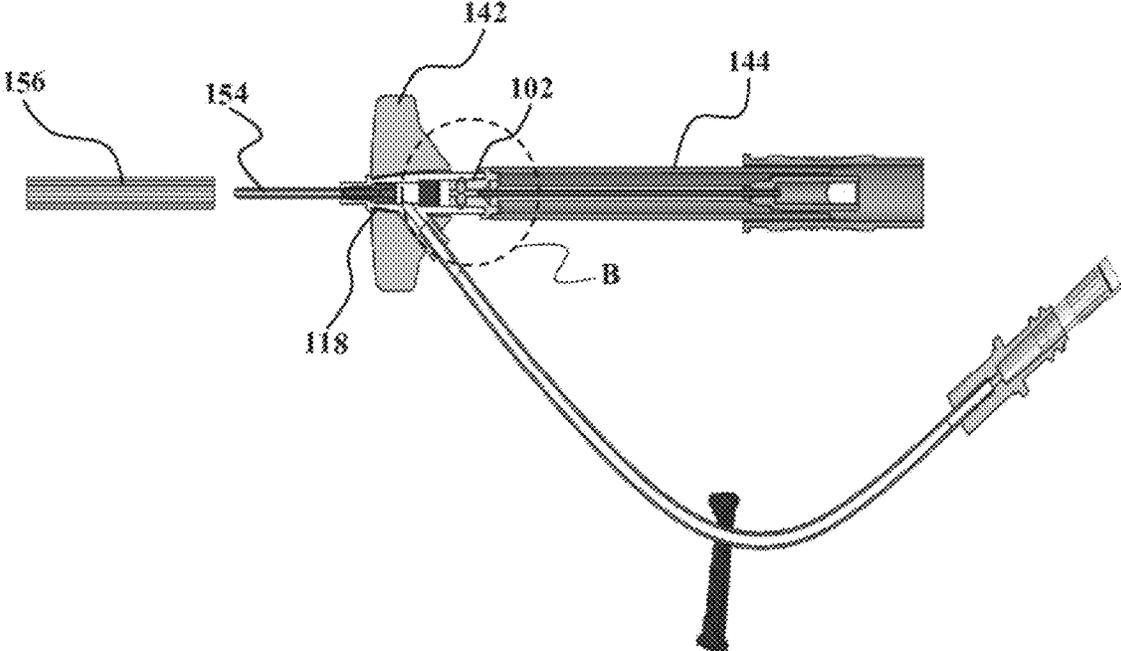
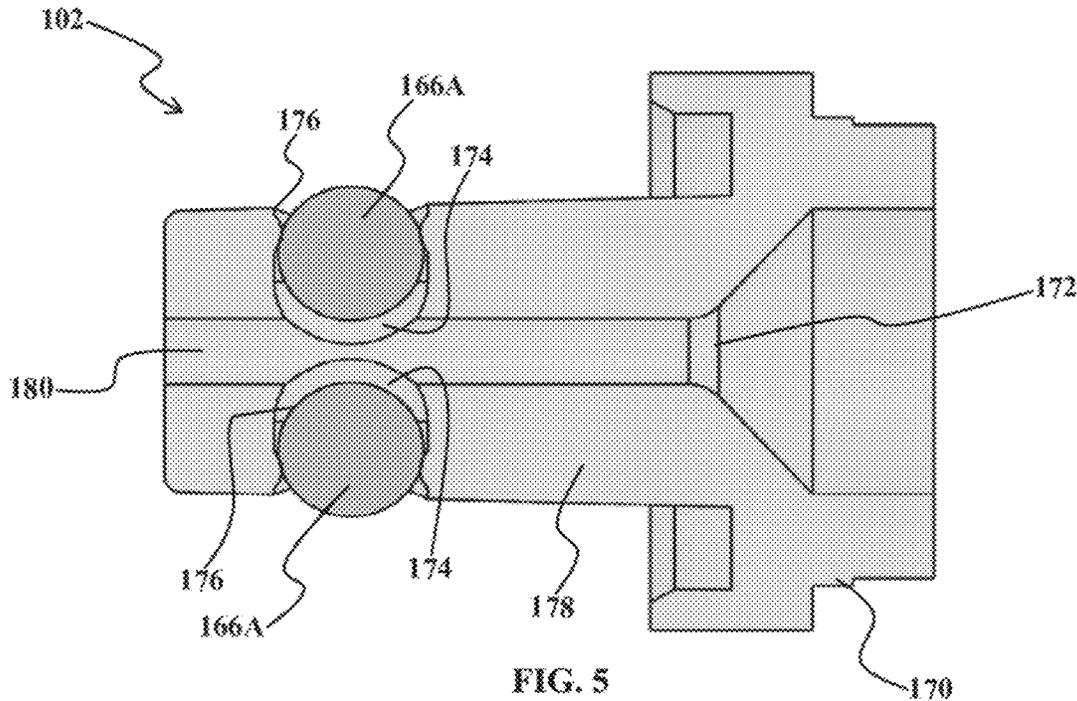
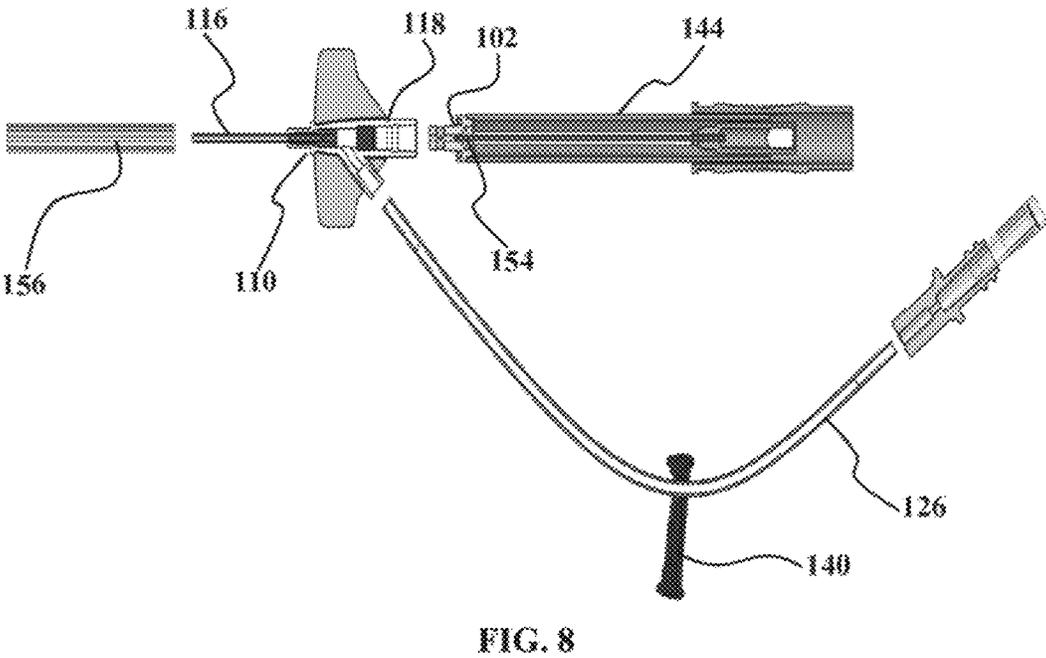
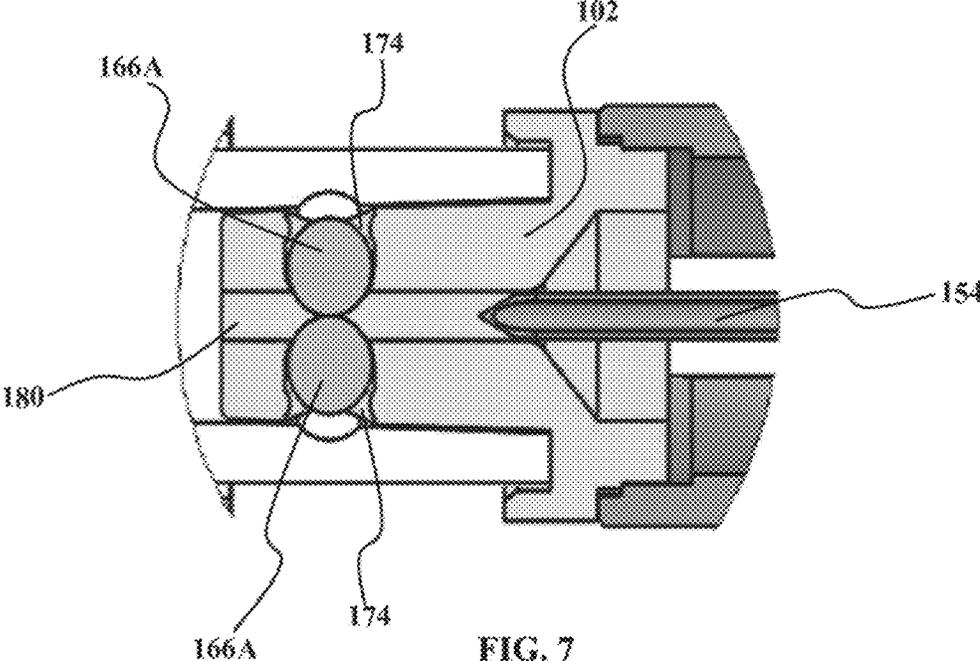


FIG. 4





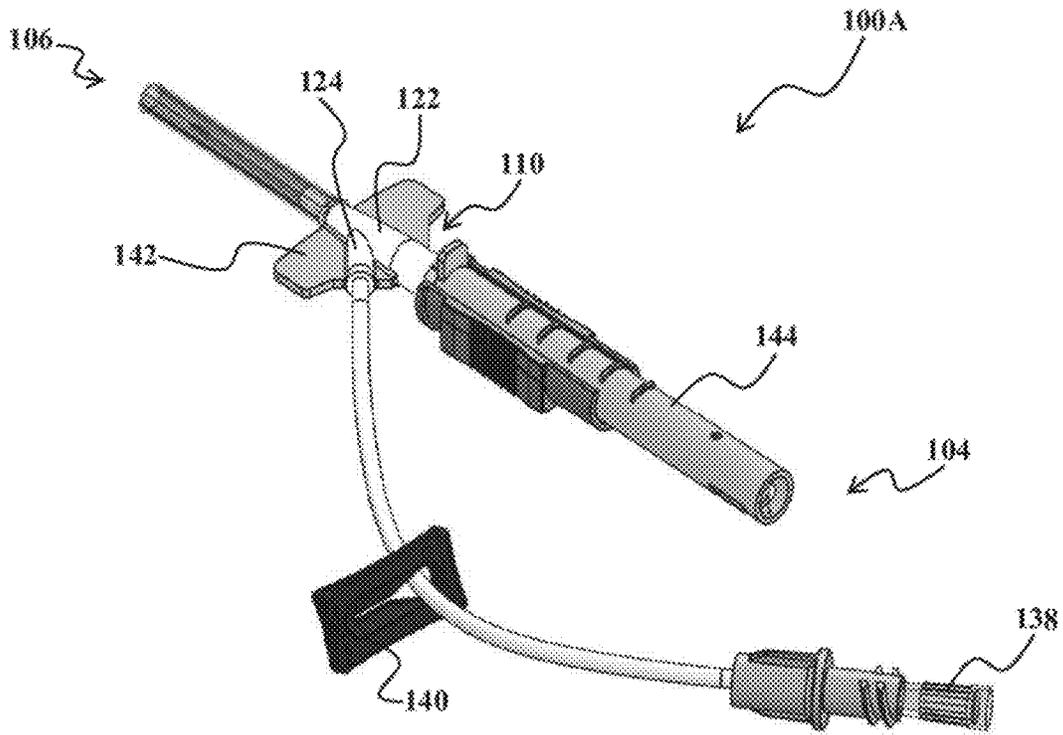


FIG. 9

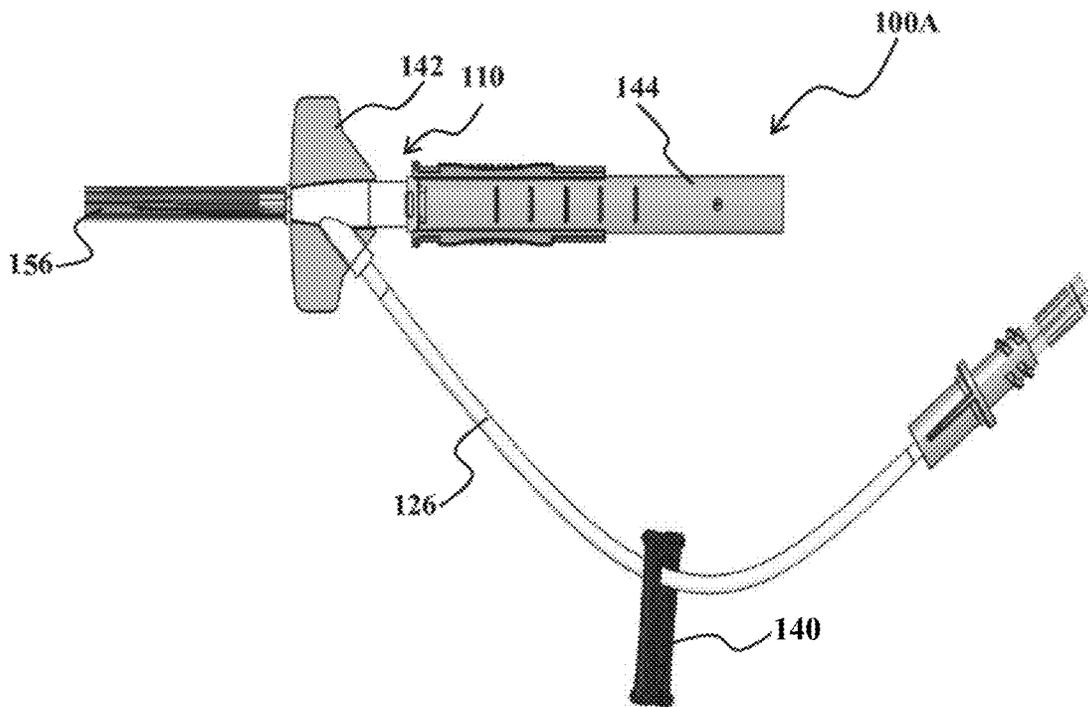


FIG. 10

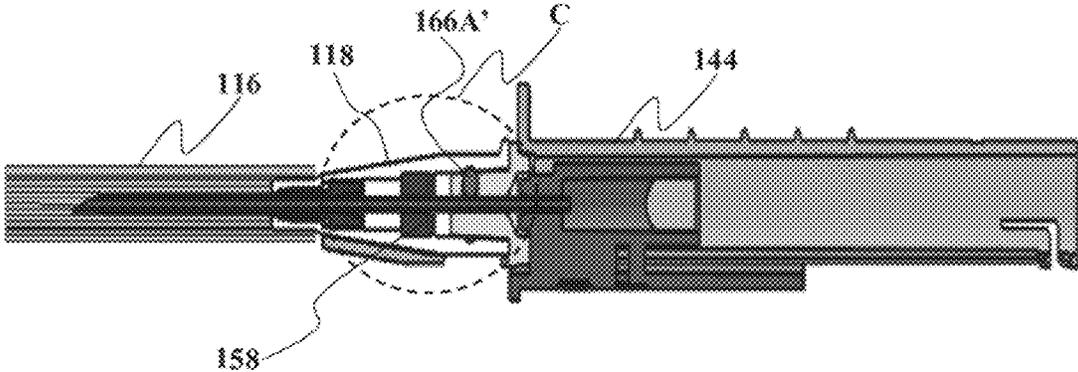


FIG. 11

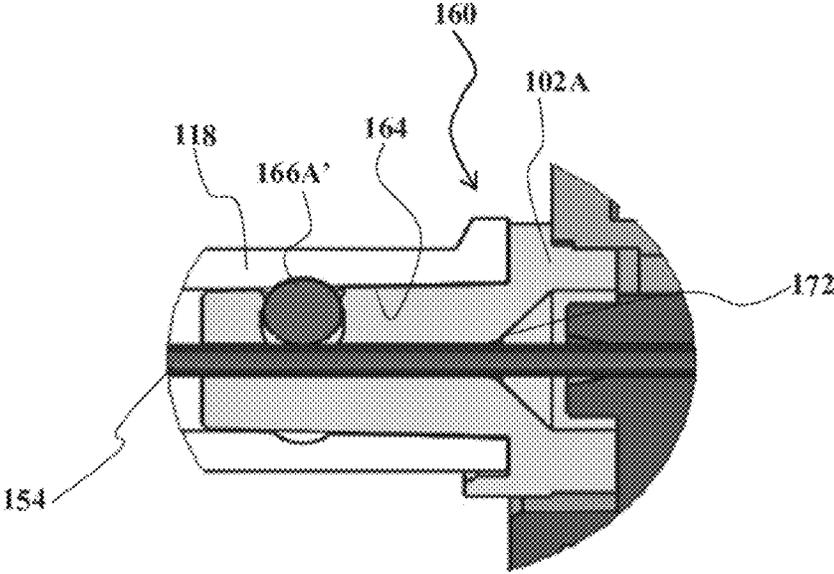
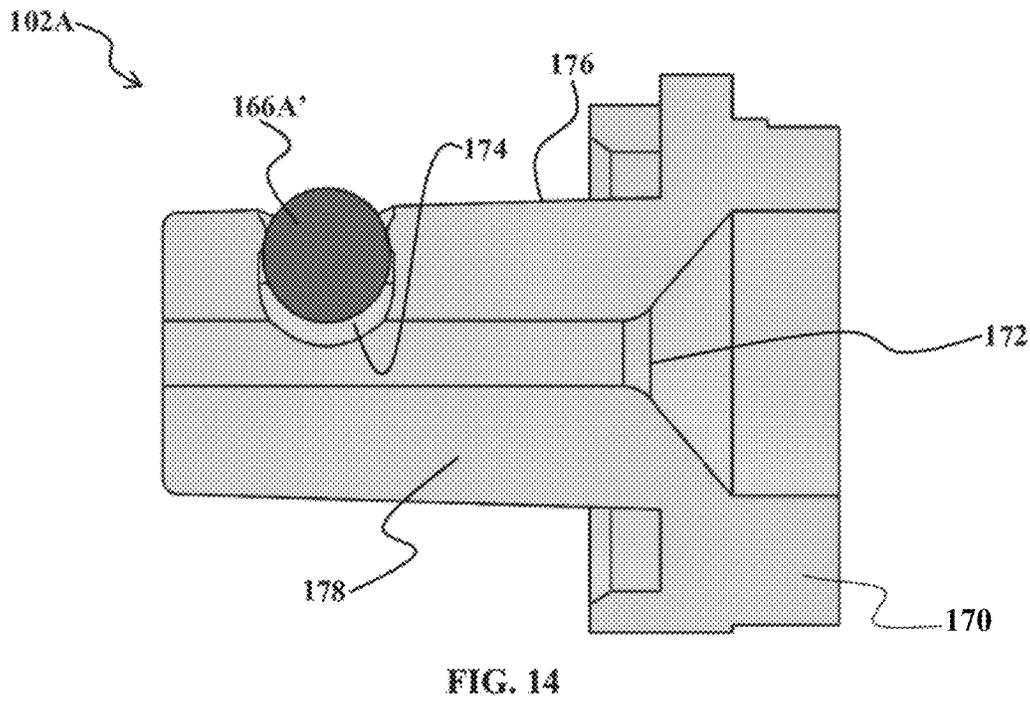
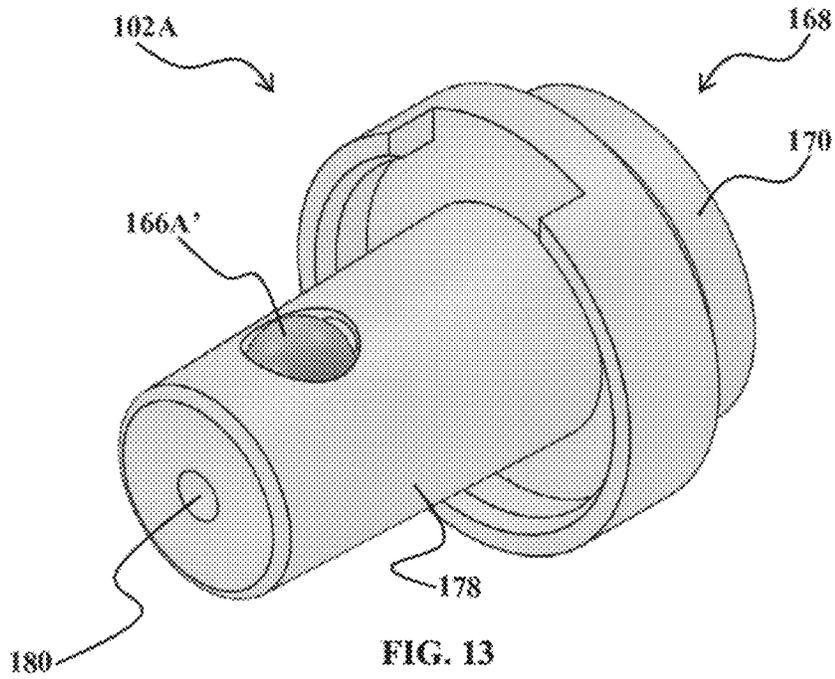


FIG. 12



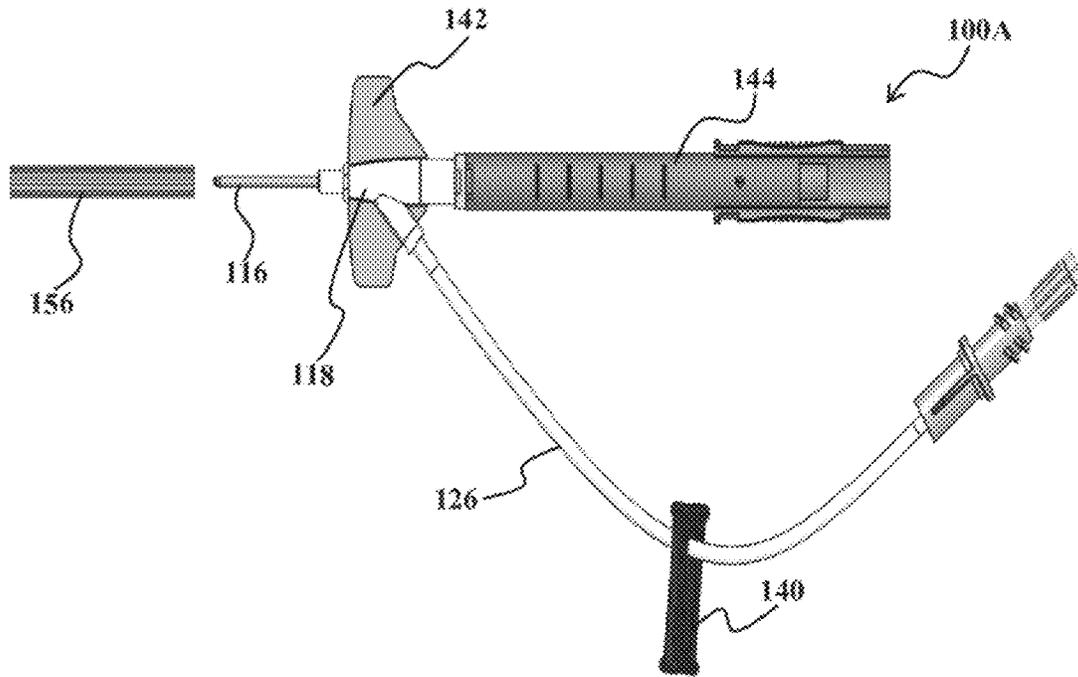


FIG. 15

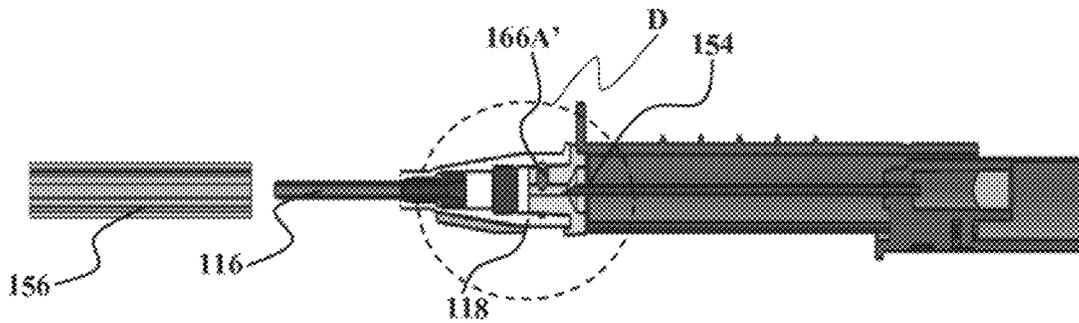


FIG. 16

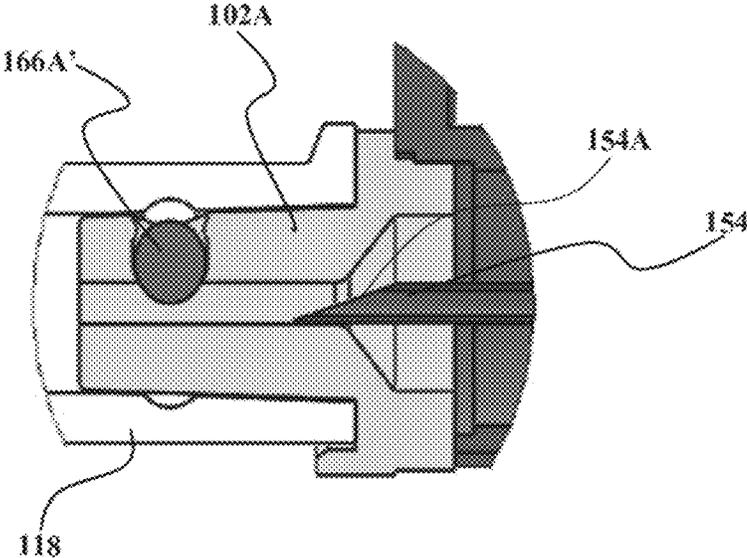


FIG. 17

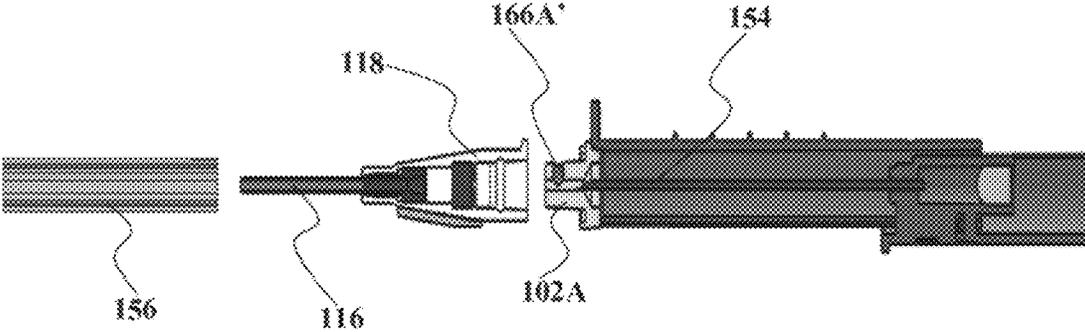


FIG. 18

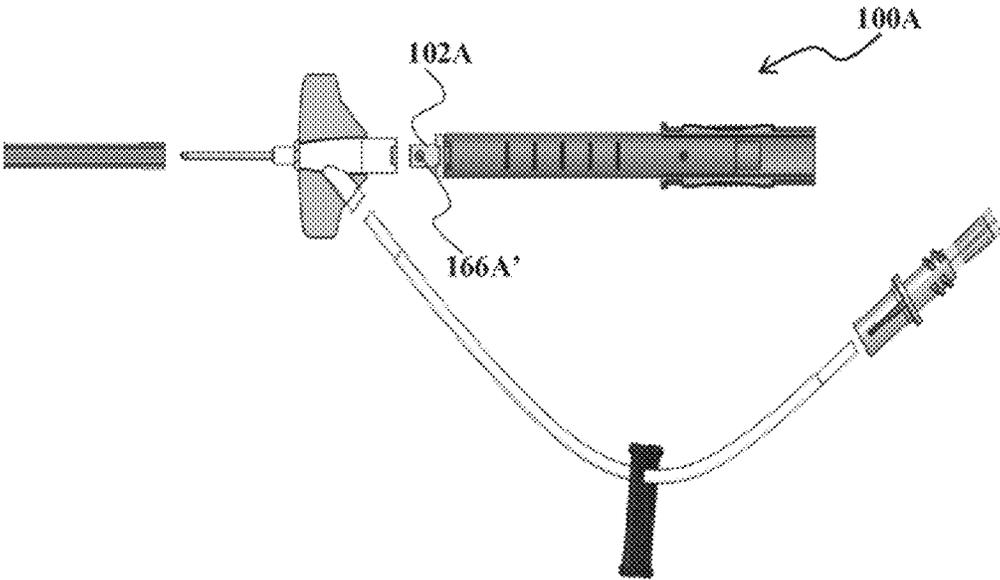


FIG. 19

SAFETY INTRAVENOUS CANNULA**CROSS-REFERENCE TO RELATED APPLICATION**

This patent application claims the priority of Indian patent application number 202111020693, filed May 6, 2021 entitled "Safety Intravenous Cannula," the disclosure content of which is hereby incorporated by reference.

TECHNICAL FIELD

The present disclosure is related to a medical device, more particularly to a locking mechanism for an intravenous cannula which prevents needle stick injuries.

BACKGROUND OF THE DISCLOSURE

Intravenous catheters are typical medical devices used to obtain continuous vascular access in patients. These devices generally have a disposable hollow-bore needle, and over the needle, a catheter made up of plastic or a polymer material has been used to access a lumen of a blood vessel in a patient. The intravenous catheter is advanced into the blood vessel and is used for administering fluid like blood or liquid medication.

When a catheter is inserted into a patient's vein for the intravenous delivery of fluid, the disposable needle passing through the catheter is utilized to make a puncture to permit the entry of the tip of the catheter into the patient's vein. The needle is then withdrawn, leaving the catheter in place either for a direct hook up to a fluid bottle to be delivered, or to be closed/capped for later use.

The needle of cannulas presently being used by medical personnel may not have safety features which can prevent needle stick injuries that may be caused due to an accidental sticking before the used cannula is disposed of. The risks associated with such needle stick injuries are very high, because of high prevalence of communicable diseases among patients who reach hospitals and especially in emergency rooms of hospitals where cannulation treatment must be initiated immediately. The costs associated with such needle stick injuries are also very high.

Therefore, the present disclosure is directed to overcome one or more of the problems set forth above.

SUMMARY OF THE DISCLOSURE

The present disclosure provides for a safety intravenous cannula. The cannula comprises a catheter assembly comprising a catheter hub, the catheter hub having a distal end connected to a proximal end of a catheter tube, and a body member adapted to accommodate the catheter hub at a distal end of the body member. The cannula also includes an elongated tubular member disposed at a proximal end of the catheter assembly. A needle hub comprising a needle holder is disposed inside the elongated tubular member. A distal end of the needle holder is connected with a needle. A safety device is fixedly connected to a distal end of the elongated tubular member at a first end of the safety device and releasably connected to the body member of the catheter assembly at a second end of the safety device. The body member is provided with an annular groove at an inner surface of the body member. The safety device comprises one or more locking elements at the second end of the safety device. The one or more locking elements of the safety device are adapted to engage with the annular groove of the

body member, thereby forming a locking engagement and a tight fit relationship between the elongated tubular member and the catheter assembly when the needle is passed through the safety device for puncturing a vein of a patient. When the needle is retracted from the catheter assembly after puncturing the vein of the patient, the body member which is in a tight fit relationship with the catheter assembly is disengaged by disengaging the locking elements from the annular groove, thereby disengaging the locking engagement between the elongated tubular member and the catheter assembly, and separating the safety device from the body member of the catheter assembly and the needle being adapted to be arrested within the safety device.

In an embodiment, the safety device comprises a groove on an outer surface of the safety device to accommodate one or more locking elements.

In an embodiment, the one or more locking elements are solid spherical elements made of stainless steel material.

In an embodiment, the groove of the safety device has a diameter more than or equal to a diameter of the solid spherical elements.

In an embodiment, the first end of the safety device has a circular base portion, the circular base portion fixedly connected with the distal end of the elongated tubular member and including a central hole.

In an embodiment, the safety device comprises a tubular portion extending from the circular base portion and includes an axial bore forming the passage for the needle from the central hole.

In an embodiment, the groove is provided on the outer surface of the tubular portion of the safety device extending towards the axial bore of the safety device.

In embodiments, the solid spherical elements of the safety device are adapted to extend outwardly to engage with the annular groove of the body member, thereby forming the locking engagement and the tight fit relationship between the elongated tubular member and the catheter assembly when the needle is passed through the safety device for puncturing the vein of the patient.

In embodiments, when the needle is retracted from the needle cover after puncturing the vein of the patient, the body member which is in a tight fit relationship with the catheter assembly is disengaged by disengaging the solid spherical elements from the annular groove, thereby disengaging the locking engagement between the elongated tubular member and the catheter assembly and separating the safety device from the body member of the catheter assembly and the needle being adapted to be arrested within the safety device.

Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

FIG. 1 shows a perspective view of a cannula having a safety device, according to a first exemplary embodiment of the present invention;

FIG. 2 shows a sectional view of the cannula shown in FIG. 1, where a needle is passed through a safety device for puncturing a vein;

FIG. 3 shows a magnified view of portion "A" indicated in FIG. 2;

FIG. 4 shows a perspective view of the safety device shown in FIGS. 2-3, according to the first exemplary embodiment of the present invention;

FIG. 5 shows a sectional view of the safety device shown in FIG. 4;

FIG. 6 shows a sectional view of the cannula, where a needle is withdrawn from the catheter assembly after puncturing the vein and a tip of the needle is arrested within the safety device;

FIG. 7 shows a magnified view of portion "B" indicated in FIG. 6;

FIG. 8 shows a sectional view of the cannula, where the safety device is separated from a body member of the catheter assembly and the needle is arrested within the safety device;

FIG. 9 shows a perspective view of a cannula having a safety device, according to a second exemplary embodiment of the present invention;

FIG. 10 shows a top view of the cannula shown in FIG. 9, where a needle is passed through a safety device for puncturing a vein;

FIG. 11 shows a sectional view of the cannula shown in FIG. 9;

FIG. 12 shows a magnified view of portion "C" indicated in FIG. 11;

FIG. 13 shows a perspective view of the safety device shown in FIGS. 11-12, according to the second exemplary embodiment of the present invention;

FIG. 14 shows a sectional view of the safety device shown in FIG. 13;

FIG. 15 shows a top view of the cannula shown in FIGS. 9 and 10, where a needle is withdrawn from the catheter assembly after puncturing the vein and a tip of the needle is arrested within the safety device;

FIG. 16 shows a sectional view of the cannula, where a needle is withdrawn from the catheter assembly after puncturing the vein and a tip of the needle is arrested within the safety device;

FIG. 17 shows a magnified view of portion "D" indicated in FIG. 16;

FIG. 18 shows a sectional view of the cannula, where the safety device is separated from a body member of the catheter assembly and the needle is arrested within the safety device; and

FIG. 19 shows a top view of the cannula shown in FIG. 18.

DETAILED DESCRIPTION OF THE DISCLOSURE

Provided below is a non-limiting exemplary embodiment of the present disclosure. Reference will now be made in detail to specific embodiments or features, examples of which are illustrated in the accompanying drawings. Wherever possible, corresponding or similar reference numbers will be used throughout the drawings to refer to the same or corresponding parts. Moreover, references to various elements described herein are made collectively or individually when there may be more than one element of the same type. However, such references are merely exemplary in nature. It may be noted that any reference to elements in the singular may also be construed to relate to the plural and vice-versa without limiting the scope of the disclosure to the exact number or type of such elements unless set forth explicitly in the appended claim.

The terms "distal or distal end" and "proximal or proximal end" as used, respectively in the present disclosure, refers to directions or ends which are farther away and closer, respectively, to the person administering a catheter into a body of a patient. The terms "connected" or "fixedly

connected" as used in the present disclosure mean that the components can be attached to each other in a fixed manner so as to form a union between them. The terms "releasably connected" imply that the components may be connected to each other, however, if the user desires, the connected elements may be disintegrated or separated from each other. The term "slidably connected" means that the components are assembled together in such a manner that any one or both of the components can be slid with respect to each other during working of the device. The contact surfaces of the components may enable sliding feature between the components. The term "disposed" as used herein means that the component/element of the device may be connected to another element in which the assembly forms a workable assembly, without hindering the working of the elements. The term "comprising" means that the device or components may include additional components apart from the components mentioned.

The disclosure may also include terms like, "one or more" or "at least", "a" or "an". It should be understood that the number mentioned should not limit the scope of the invention. In some examples, a single component may form a workable assembly, and in some other examples, "two or more" components may form a workable assembly. Such terms or limitation should not be considered to be limiting the scope of the invention. The skilled person may find or obtain multiple such combinations during regular permutation and combinations while bringing the invention to a workable model, and thereafter may find the device to be workable.

The disclosure may further include terms which may define shapes, like, "circular" or "cylindrical" or "converging" or "tapered" or "diverging" or "expanding". Again, such terminologies which define the shapes may be limiting to exemplary embodiments illustrated in the figures. It should not be meant that there are no other shapes possible. A person of ordinary skill in the art may come up with any other shape or combination of such shapes, which would lead to workability of the device. Therefore, any such alteration would still be covered in the disclosure without departing from the inventive step of the invention.

The terminology used in the present disclosure includes the words specifically mentioned, derivatives thereof and words of similar import. The embodiments illustrated below are not intended to be exhaustive or to limit the invention to the precise form disclosed. These embodiments are chosen and described to best explain the principle of the invention and its application and practical use and to enable others skilled in the art to best utilize and develop the invention.

FIG. 1 illustrates a perspective view of a cannula (100) comprising a safety device (102) (shown in FIG. 2), according to a first exemplary embodiment of the present invention. The cannula (100) is a medical device used on patients (not shown) undergoing a treatment for administration of a medication fluid or gases by an intravenous therapy or removal of body fluid for example 'blood sample', from the patients for a laboratory analysis. The terms "cannula" and "safety intravenous cannula" are interchangeably used in the present disclosure. It should be understood that the "cannula" and the "safety intravenous cannula" are one and the same. The term "cannula" may be used more often for sake of brevity.

In the illustrated FIGS. 1 and 2, the cannula (100) has a first end (104) closer to a user or an operator (not shown) and a second end (106) closer to the patient or a body part of the patient. The terms "user" or "operator" as used in the present disclosure may include, but are not limited to, medical

personnel like nurses or paramedical staff who may work under a direction and supervision of doctors or physicians or surgeons. In the illustrated Figures, the cannula (100) comprises a catheter assembly (108) towards the second end (106) of the cannula (100). The catheter assembly (108) has a catheter hub (110) having a distal end (112) and is connected to a proximal end (114) of a catheter tube (116). The catheter assembly (108) further includes a body member (118) adapted to accommodate the catheter hub (110) at a distal end (120) of the body member (118).

The body member (118) in the illustrated exemplary embodiment is a Y-type body member. It is to be understood that the body member (118) may be of any other kind available in the market. The illustrated example of a Y-type body member is not limiting the scope of the present invention. A skilled person in the art may implement a suitable body member in the cannula for working of the cannula (100), and thus the specific example of a Y-type body member should not be construed as the only kind which can be implemented with the cannula (100) described in the present invention. The illustrated Y-type body member (118) has a cylindrical body portion (122) along the catheter hub (110) and a tangential portion (124) connected to the cylindrical body portion (122). Both the cylindrical body portion (122) and the tangential portion (124) are integrally formed or manufactured. In another embodiment, the tangential portion (124) may be releasably connected to the cylindrical body portion (122) of the body member (118). The fluids are as described above.

One end (128) of the tube (126) may be connected to the tangential portion (124) of the body member (118) and a second end (130) of the tube (126) may be connected to a flashback chamber (132). The flashback chamber (132) may include a female luer (134), a flow control hub (136) and a filter (138). The tube (126) may be further provided with a slide clamp (140) for arranging the tube (126) with a stand or supporting column (not shown). The cannula (100) is further provided with a wing member (142) around the body member (118). The wing member (142) may aid in connecting or affixing the catheter assembly (108) with the patient's body part like a hand after puncturing the vein.

The safety intravenous cannula (100) further comprises an elongated tubular member (144). The elongated tubular member (144) is disposed at a proximal end (146) of the catheter assembly (108). The cannula (100) further comprises a needle hub (148) comprising a needle holder (150). The needle holder (150) is disposed inside the elongated tubular member (144), wherein a distal end (152) of the needle holder (150) is connected with a needle (154). In the illustrated FIGS. 1 and 2, a needle protector (156) (more clearly shown in FIGS. 6 and 8) is provided covering the needle (154).

FIG. 2 illustrates a sectional view of the cannula (100) shown in FIG. 1. In this illustration, the needle (154) is passed through the safety device (102) according to the first exemplary embodiment of the present invention. After passing the safety device (102), the needle (154) passes through a rubber valve (158) disposed inside the body member (118), the catheter hub (110) and the catheter tube (116) for puncturing the vein. The safety device (102) is fixedly connected to a distal end (160) of the elongated tubular member (144) and releasably connected to the body member (118) of the catheter assembly (108) at an end opposite to the distal end (160) (more clearly shown in FIG. 3). In FIGS. 2 and 3 it is illustrated that the needle (154) is passed through the safety device (102) for puncturing the vein of the patient. FIG. 3 illustrates a magnified view of portion "A" indicated

in FIG. 2. It is illustrated that the safety device (102) is provided between the body member (118) of the catheter assembly (108) and the elongated tubular member (144). The cylindrical body portion (122) of the body member (118) includes an annular groove (162) at an inner surface (164) of the body member (118). The annular groove (162) in the body member (118) is adapted to engage with one or more locking elements (166) of the safety device (102) when the needle (154) is passed through the safety device (102). In the illustrated figure, the locking elements (166) are solid spherical elements.

FIGS. 4 and 5 illustrate a perspective view and a sectional view of the safety device (102), respectively, according to the first exemplary embodiment of the present invention. The safety device (102) comprises a first end (168) having a circular base portion (170). The circular base portion (170) is fixedly connected with the distal end (160) of the elongated tubular member (144) (shown in FIGS. 2 and 3). In an exemplary embodiment, the circular base portion (170) of the safety device (102) is press-fitted to the elongated tubular member (144) forming a unison between the safety device (102) and the elongated tubular member (144). The circular base portion (170) is provided with a central hole (172) (shown in FIG. 5) for passage of the needle (154). The safety device (102) comprises one or more grooves (174) (shown in FIG. 5) on an outer surface (176) to accommodate the one or more locking elements (166). In the illustrated embodiment, the safety device (102) comprises a tubular portion (178) extending from the circular base portion (170) and includes an axial bore (180) forming the passage for the needle (154) from the central hole (172). The one or more grooves (174) are provided on the outer surface (176) of the tubular portion (178)/the safety device (102) and extend towards the axial bore (180) of the safety device (102). In the illustrated exemplary embodiment, there are two grooves (174) (clearly shown in FIG. 5) to accommodate the two locking elements (166).

In the illustrated figures, the two locking elements (166) are solid spherical elements. The solid spherical elements may be in the form of solid balls made of stainless steel material. It may be understood that the solid spherical elements (166A) may be made of any other materials which are bio-compatible or non-reactive to the fluids passing through the cannula.

The grooves (174) made on the outer surface (176) of the safety device (102) have substantially the same diameter as that of a diameter of the solid spherical elements (166A), or the grooves (174) of the safety device (102, 102A) may have a diameter greater than a diameter of the solid spherical elements (166A). This facilitates easy or smooth movement of the spherical balls outwardly when the needle (154) is passed through the axial bore (180) while puncturing the vein or withdrawn after puncturing the vein. In another exemplary embodiment, the diameter of the each groove (174) may be less or more than the diameter of the solid spherical elements. However, the diameters should be kept in such a manner that the movement of the spherical balls should not be hindered.

In the illustrated embodiments of FIGS. 2 and 3, the locking elements (166) or the solid balls of the safety device (102) are adapted to engage with the annular groove (162) of the body member (118). This forms a locking engagement and a tight fit relationship between the elongated tubular member (144) and the catheter assembly (108) when the needle (154) is passed through the safety device (102) for puncturing the vein of the patient.

FIG. 6 illustrates a sectional view of the cannula (100) shown in FIGS. 1 and 2, where the needle (154) is withdrawn from the catheter assembly (108) after puncturing the vein and a tip or bevel (154A) of the needle (154) is arrested within the safety device (102). FIG. 7 shows a magnified view of portion "B" indicated in FIG. 6, where the tip or bevel (154A) of the needle (154) is arrested or accommodated in the safety device (102).

In the illustrated FIGS. 6 and 7, when the needle (154) is retracted from the catheter assembly (108) after puncturing the vein of the patient, the body member (118) which is in a tight fit relationship with the catheter assembly (108) is disengaged. The disengagement occurs because the locking elements (solid balls) (166A) are disengaged or displaced from the annular groove (162) of the body member (118), thereby disengaging the locking engagement between the elongated tubular member (144) and the catheter assembly (108), and separating the safety device (102) from the body member (118) of the catheter assembly (108). The separation of the safety device (102) from the body member (118) of the catheter assembly (108) (also shown in FIG. 8) arrests the needle (154) within the safety device (102). Thus, when the needle (154) is withdrawn after puncturing the vein, the needle tip or the bevel (154A) of the needle (154) accommodates inside the safety device (102) and will not be exposed, preventing needle stick injuries.

FIGS. 9 and 10 illustrate perspective and top views of a cannula (100A) having a safety device (102A), respectively, according to a second exemplary embodiment of the present invention. FIG. 11 shows a sectional view of the cannula (100A) shown in FIGS. 9 and 10, where a needle (154) is passed through a safety device (102A) for puncturing the vein.

After passing through the safety device (102A) (shown in FIG. 12), the needle (154) passes through the rubber valve (158) disposed inside the body member (118), the catheter hub (110) and the catheter tube (116) for puncturing the vein. The safety device (102A) is fixedly connected to the distal end (160) of the elongated tubular member (144) and releasably connected to the body member (118) of the catheter assembly (108) at the end opposite to the distal end (160) (more clearly shown in FIG. 12). In FIGS. 11 and 12 it is illustrated that the needle (154) is passed through the safety device (102A) for puncturing the vein of the patient. FIG. 12 illustrates a magnified view of portion "C" indicated in FIG. 11. It is illustrated that the safety device (102A) is provided between the body member (118) of the catheter assembly (108) and the elongated tubular member (144). The cylindrical body portion (122) of the body member (118) includes the annular groove (162) at the inner surface (164) of the body member (118). The annular groove (162) in the body member (118) is adapted to engage with the locking element (166A') of the safety device (102A) when the needle (154) is passed through the safety device (102A). In the illustrated figure, the locking element (166A') is one solid spherical element (166A').

FIGS. 13 and 14 illustrate a perspective view and a sectional view of the safety device (102A), respectively, according to the second exemplary embodiment of the present invention. The safety device (102A) comprises the first end (168) having the circular base portion (170). The circular base portion (170) is fixedly connected with the distal end (160) of the elongated tubular member (144). In an exemplary embodiment, the circular base portion (170) of the safety device (102A) is press-fitted to the elongated tubular member (144) forming a unison between the safety device (102A) and the elongated tubular member (144). The

circular base portion (170) is provided with the central hole (172) for passage of the needle (154). The safety device (102A) comprises one groove (174) on the outer surface (176) to accommodate the one locking element (166A'). In the illustrated embodiment, the safety device (102A) comprises the tubular portion (178) extending from the circular base portion (170) and includes the axial bore (180) forming the passage for the needle (154) from the central hole (172). The groove (174) is provided on the outer surface (176) of the tubular portion (178) and extends towards the axial bore (180) of the safety device (102A).

In the illustrated figures, the locking element (166A') is one solid spherical element (166A'). The solid spherical element may be in the form of a solid ball (166A') made of stainless steel material. It may be understood that the solid spherical element may be made of any other materials which are bio-compatible or non-reactive to the fluids passing through the cannula (100).

The groove (174) made on the outer surface (176) of the tubular portion (178) of the safety device (102A) has the same or substantially same or equal diameter as that of the diameter of the solid spherical element. This facilitates easy or smooth movement of the spherical ball outwardly when the needle (154) is passed through the axial bore (180) while puncturing the vein or withdrawn after puncturing the vein. In another exemplary embodiment, the diameter of the groove (174) may be less or more than the diameter of the solid spherical element. However, the diameters should be kept in such a manner that the movement of the spherical ball should not be hindered.

In the illustrated embodiments of FIGS. 13 and 14, the locking element or the solid ball (166A') of the safety device (102A) is adapted to engage with the annular groove (162) of the body member (118). This forms a locking engagement and a tight fit relationship between the elongated tubular member (144) and the catheter assembly (108) when the needle (154) is passed through the safety device (102A) for puncturing the vein of the patient.

FIGS. 15 and 16 illustrate top and sectional views of the cannula (100A), respectively, shown in FIGS. 9-11, where the needle (154) is withdrawn from the catheter assembly (108) after puncturing the vein and the tip or bevel of the needle (154) is arrested within the safety device. FIG. 17 shows a magnified view of portion "D" indicated in FIG. 16, where the tip or bevel (154A) of the needle (154) is arrested or accommodated in the safety device (102A).

In the illustrated FIGS. 18 and 19, when the needle (154) is retracted from the catheter assembly (108) after puncturing the vein of the patient, the body member (118) which is in a tight fit relationship with the catheter assembly (108) is disengaged. The disengagement occurs because the locking element (solid ball) (166A') is disengaged or displaced from the annular groove (162), thereby disengaging the locking engagement between the elongated tubular member (144) and the catheter assembly (108), and separating the safety device from the body member of the catheter assembly. The separation of the safety device (102A) from the body member (118) of the catheter assembly (108) makes the needle (154) to be arrested within the safety device (102A). Thus, when the needle (154) is withdrawn after puncturing the vein, the needle tip or the bevel (154A) of the needle (154) accommodates inside the safety device (102A) and will not be exposed, preventing needle stick injuries.

Advantages

The disclosed safety device prevents the tip of the needle from coming in contact with the user after withdrawing the

needle. The needle gets arrested within the safety device. That is to say, the safety device provides a safety mechanism such that the tip of the needle does not come in contact with the operator or the patient when the needle is withdraw after piercing the vein of the patient. Thus, serious injuries or infections that would have been caused by the needle are prevented.

The disclosed locking elements of solid spherical balls provides disengagement of the catheter assembly and the elongated tubular member, and the needle tip is accommodated or arrested inside the safety device attached to the elongated tubular member, preventing exposure of needle tip and needle stick injuries.

The disclosed locking elements of solid spherical balls of the safety device enable the easy removal of the needle by unlocking the locking engagement.

While aspects of the present invention have been particularly shown and described with reference to the embodiments above, it will be understood by those skilled in the art that various additional embodiments may be contemplated by modification of the disclosed device without departing from the scope of what is disclosed. Such embodiments should be understood to fall within the scope of the present invention as determined based upon claims and any equivalents thereof.

LIST OF REFERENCE NUMERALS AND REFERENCE SIGNS

100	Cannula
100A	Cannula
102	Safety device
102A	Safety device
104	First end of the cannula
106	Second end of the cannula
108	Catheter assembly
110	Catheter hub
112	Distal end of the catheter hub
114	Proximal end of a catheter tube
116	Catheter tube
118	Body member
120	Distal end of the body member
122	Cylindrical body portion
124	Tangential portion
126	Tube
128	One end of tube
130	Second end of tube
132	Flashback chamber
134	Female luer
136	Flow control hub
138	Filter
140	Slide clamp
142	Wing member
144	Elongated tubular member
146	Proximal end of the catheter assembly
148	Needle hub
150	Needle holder
152	Distal end of the needle holder
154	Needle
154A	Tip or bevel of the needle
156	Needle protector
158	Rubber valve
160	Distal end of elongated tubular member
162	Annular groove in the body member
164	Inner surface of the body member
166	Locking elements
166A'	Locking element
166A	Solid balls
166A'	Solid ball
168	First end of the safety device
170	Circular base portion
172	Central hole

-continued

174	One or more grooves on the safety device
176	Outer surface of the safety device
178	Tubular portion of the safety device
180	Axial bore of the tubular portion of the safety device

The invention claimed is:

1. A safety intravenous cannula, comprising:
 - a catheter assembly comprising a catheter hub, the catheter hub having a distal end connected to a proximal end of a catheter tube, and a body member having a cylindrical portion along the catheter hub;
 - an elongated tubular member disposed at a proximal end of the catheter assembly;
 - a needle hub comprising a needle holder disposed inside the elongated tubular member, wherein a distal end of the needle holder is connected with a needle;
 - a safety device having a proximal portion fixedly connected to a distal end of the elongated tubular member and releasably connected to the body member of the catheter assembly, wherein the body member is provided with an annular groove at an inner surface of the body member, and wherein the safety device comprises one or more locking elements, wherein the one or more locking elements of the safety device are adapted to engage with the annular groove of the body member, thereby forming a locking engagement and a tight fit relationship between the elongated tubular member and the catheter assembly when the needle is passed through the safety device for puncturing a vein of a patient, and wherein when the needle is retracted from the catheter assembly after puncturing the vein of the patient, the body member which is in a tight fit relationship with the catheter assembly is disengaged by disengaging the one or more locking elements from the annular groove, thereby disengaging the locking engagement between the elongated tubular member and the catheter assembly, and separating the safety device from the body member of the catheter assembly, the needle being adapted to be arrested within the safety device.
2. The safety intravenous cannula of claim 1, wherein the safety device comprises a groove on an outer surface of the safety device to accommodate the one or more locking elements.
3. The safety intravenous cannula of claim 2, wherein the one or more locking elements are solid spherical elements made of a stainless steel material.
4. The safety intravenous cannula of claim 3, wherein the groove on the outer surface of the safety device has a diameter more than or equal to a diameter of the solid spherical elements.
5. The safety intravenous cannula of claim 3, wherein the solid spherical elements of the safety device are adapted to move outwardly to engage with the annular groove of the body member, thereby forming the locking engagement and the tight fit relationship between the elongated tubular member and the catheter assembly when the needle is passed through the safety device for puncturing the vein of the patient.
6. The safety intravenous cannula of claim 3, wherein when the needle is retracted from the catheter assembly after puncturing the vein of the patient, the body member which is in a tight fit relationship with the catheter assembly is disengaged by disengaging the solid spherical elements from

the annular groove, thereby disengaging the locking engagement between the elongated tubular member and the catheter assembly, and separating the safety device from the body member of the catheter assembly, the needle being adapted to be arrested within the safety device. 5

7. The safety intravenous cannula of claim 1, wherein the proximal portion of the safety device has a circular base portion, the circular base portion fixedly connected with the distal end of the elongated tubular member and including a central hole. 10

8. The safety intravenous cannula of claim 7, wherein the safety device comprises a tubular portion extending from the circular base portion and including an axial bore forming a passage for the needle within the central hole.

9. The safety intravenous cannula of claim 8, wherein a 15 groove provided on an outer surface of the tubular portion of the safety device extends towards the axial bore of the safety device.

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